Polish Journal of Veterinary Sciences Vol. 16, No. 2 (2013), 381–383

DOI 10.2478/pjvs-2013-0051

Short communication

Reduction of prevalence of persistent BVDV infection in cattle herds by long-term vaccination program (preliminary clinical study)

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Abstract

Effectiveness of long-term anti-BVDV vaccination program in reducing prevalence of persistent BVDV infection in cattle herds was evaluated in seven years observational study (2005-2011). Among three seropositive dairy cattle herds (within herd seroprevalence 100%, confirmed by ELISA Herd Check BVDV Ab, IDEXX, Sweden) vaccination program based on inactivated vaccine (cytopathic strain 5960) was commenced in 2007 in two herds and continued till 2010. In the years 2007-2011 all calves aged 2-12 weeks in all three herds were tested yearly with RT-PCR in order to detect persistently infected individuals. For the entire study period true prevalence of BVDV persistent infection was significantly lower in vaccinated than in non-vaccinated herd. This may imply the role of long-term vaccination program in reducing prevalence of persistent BVDV infection in cattle herds.

Key words: BVDV, persistent infection, calves, vaccination, eradication

Introduction

Bovine viral diarrhea virus (BVDV) is widespread in cattle population all over the world. The non-cytopathic biotype of BVDV causes fetal infection during the first trimester of pregnancy, what in turn leads to the delivery of persistently infected (p.i.) calves, which are crucial for virus in a population. Control programs based on vaccination as well as identification and elimination of p.i. animals allow for eradication of the disease in cattle herds (Moening et al. 2005). The objective of the study was to evaluate effectiveness of long-term anti-BVDV vaccination programs in reducing prevalence of persistent BVDV infections in cattle herds.

Materials and Methods

Three closed seropositive dairy cattle herds (A, B and C), where only inside replacements were raised for the entire study period, were taken into account for research purpose in years 2005-2011. Herd size ranged from 760 to 858 for herd A, from 1093 to 1175 for herd B and from 2078 to 2198 for herd C. In 2005-2006 serological testing covered only cows older

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Table 1. True prevalence of persistent BVDV infection in calves from vaccinated and non-vaccinated herds in years 2007-2011.

Year	Vaccinated herds		Non-vaccinated herd		p-value
	+ve / all calves	Prevalence (CI 95%)	+ve / all calves	Prevalence (CI 95%)	
2007	1 / 814	0.1% (0-0.7%)	9 / 492	1.8% (1.0-3.4%)	0.0005*
2008	0 / 865	0% (0-0.4%)	4 / 487	0.8% (0.3-2.1%)	0.0084*
2009	0 / 846	0% (0-0.5%)	3 / 470	0.6% (0.2-1.9%)	0.0241*
2010	0 / 869	0% (0-0.4%)	5 / 483	1.0% (0.4-2.4%)	0.0031*
2011	0 / 364	0% (0-1.0%)	2 / 197	1.0% (0.3-3.6%)	0.0560

* statistically significant difference (α=0.05).

than 24 months (ELISA Herd Check BVDV Ab, IDEXX, Sweden; sensitivity 96.9%, specificity 97.8%) (Beaudeau et al. 2001). Number of animals tested in each herd was calculated with the use WinEpiscope® (EPIDECON) for expected seroprevalence of 50%, accepted error of 5% and 95% level of confidence, were respectively 290, 320 and 360. In 2007 vaccination program against BVD based on inactivated vaccine with BVDV-1 cytopathic strain 5960 was launched in herds A and B (lasted till 2010) and molecular diagnostic for BVDV (ADIAVET™ BVD REAL TIME kit Biomedica, Austria) was started in all three herds among calves between 2 and 12 weeks. Positive results were confirmed in isolated calves in 6-8 weeks later (retesting) and animals positive in both tests were found as p.i. Sensitivity of 100% and specificity of 99% were assumed for RT-PCR test (Hilbe et al. 2007). True within-herd prevalence of BVDV was calculated using EpiTools (Sergeant 2012) and the figures were compared between vaccinated and non-vaccinated herds with z-test for two proportions using Statistica 20 (StatSoft).

Results and Discussion

Antibodies to BVDV were present in all three herds and true within-herd seroprevalence was 100% (98.6-100%). For the entire study period true prevalence of BVDV persistent infection was significantly lower in vaccinated herds than in non-vaccinated herd (Table 1).

Occurrence of the BVDV within herd always leads to transient and persistent infections but acutually or persistently infected BVDV animals are the major source of the virus for an entire herd. Historically it was believed that p.i. animals used to die early in life, however nowadays screening study, for BVDV persistent infection suggest that many of them may reach maturity (Bolin 1990). Proposed strategies of BVD control and eradication depends on overall prevalence of BVDV infection in cattle population and financial limitations (Bitsch et al. 2000, Presi et al. 2010). The most important parts of the control programs are detection and elimination currently existing p.i. animals and reducing the number of p.i. animals born in a herd. Vaccines for cows and heifers block the life-cycle of BVDV and as a consequence restrict new infections and the infection pressure for the whole herd. A new Swiss models of BVD eradication was designated at high seroprevalence. All new-born calves were tested for antigen using ear notches, p.i. animals were eliminated and movement restrictions were applied. The campaign succeeded in reducing proportion of BVDV-positive newborn calves from 1.8% in 2008 to under 0.2% in 2010 (Zimmerli et al. 2009, Presi et al. 2011). Our study project is the first field evaluation of effectiveness of long-term vaccination program in reducing prevalence of persistent BVDV infection in cattle herds. Although optimization of protective immunity through vaccination was not estimated in our study, it is well known that vaccinations are only partially effective in protection against fetal infection (Kelling 2004). Management in closed herds was the second parameter that allowed reduction of persistent BVDV infection during our observation. Further study is needed to characterize the BVD viruses circulating within vaccinated herds. Given current epidemiological situation in Poland, obligatory BVD control program is warranted. Nevertheless, based on our five-year field observation it can be concluded that the preliminary model described above could be the temporary alternative for obligatory BVD control programs. It should be noted, however, that the present model is not “ready-to-use” prescription for solving the problem of BVDV in cattle.

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